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Why neurons move messages: mechanisms and biological significance of RNA localization

Prof. Paolo Macchi

CIBIO – Centre for Integrative Biology
University of Trento

ABSTRACT OF THE TALK

The localization of messenger RNAs allows a cell to restrict certain proteins to specific subcellular domains. In neurons, this process critically contributes to long-term synaptic plasticity and thereby to higher brain functions such as learning and memory. Key components of the mRNA transport machinery, so-called trans-acting factors, are conserved across species including the RNA-binding protein Staufen (Stau), the zipcode binding proteins (ZBPs) and the heterogeneous nuclear ribonucleoproteins (hnRNPs). In this context, one key feature of mRNA localization is that the transcript has to be kept translationally silent during its transport towards its target compartment. As a consequence, RNA transport and control of translation are thought to be tightly coupled. In many cases, the loss of one component of the transport machinery or the misexpression of a specific mRNA causes abnormalities during neuronal development, for example in axonal and dendritic outgrowth or in the development of dendritic spines.

We are interested in understanding the molecular mechanisms of RNA localization in neurons. We want to identify which proteins bind to and transport the mRNAs into dendrites and deliver them to synapses. The talk will focus on our recent data regarding the characterization of two RNA-binding proteins namely Staufen and Pumilio in neurons and their role in neuronal development.